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COMPLETE SPECIFICATION.

Communicated by THE SINGER MANUFACTURING COMPANY, of Elizabeth, New Jersey, United States of America, Sewing Machine Manufacturers and Dealers.

Buttonhole Cutting and Stitching Machine.

I, WALLACE FAIRWEATHER, C.E., of 62, Saint Vincent Street, Glasgow, and 65—66, Chancery Lane, London, W.C., Chartered Patent Agent, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

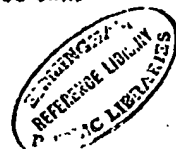
This invention relates more particularly to buttonhole cutting and stitching machines adapted for producing both eyelet-ended and straight buttonholes in cloth garments such as men's coats; and it has for its object to facilitate changes of cutting and stitching conditions whereby either style of buttonhole stitching may be produced at will.

Broadly considered the invention consists in the provision in a buttonhole cutting and stitching machine of selectively interchangeable cutting elements of different contour and separate controlling or guiding devices with which the work holder is adapted to be selectively connected for the purpose of imparting movements to the work holder during the stitching operation in accordance with the contour of the cutting element selected.

As hereinafter described, the machine contains cutting mechanism comprising a cutter-carrying lever upon which are mounted an eyelet-ended cutting blade and a straight cutting blade each adapted to assume an operative position in register with an opposed cutting element. The work-holder receives travelling and side-shift movements relatively to the stitch-forming mechanism through connections with the usual feed-cam, one of said connections comprising a side-shift lever carrying a cam-follower adapted to be locked either in operative relation with the cam-track of the feed-cam for production of the usual side-shift movements or with a guiding device for preventing lateral movement of the work-holder while permitting longitudinal travelling or feeding movements thereof.

In the accompanying drawings, Fig. 1 is a rear side elevation of the lower portion of a buttonhole cutting and stitching machine constructed in substantial accordance with that of the Specification of my Application No. 9842 of 1913, and Fig. 2 a plan of the same. Fig. 3 is a front side elevation of a portion of the machine including the cutter-controlling and stop-motion devices. Fig. 4 is a perspective view of the feeding mechanism and a portion of its controlling means. Fig. 5 is a side elevation of the cutting device, Fig. 6 a plan of one of the cutter-carrying levers, and Fig. 7 an end view, upon a larger scale, of the slide-block carrying the interchangeable cutting elements. Fig. 8 is an enlarged detail view, partly in section, representing a portion of the feed-cam and the follower carried by said shift-lever.

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The machine is shown constructed with the hollow rectangular base 1 whose top affords a bed-plate from which rises the bracket-arm standard. Mounted within and longitudinally of the base is the main-shaft 4 having suitable operative connections with the reciprocating and laterally jogging needle-clamp in which is secured the eye-pointed needle 6 cooperating in the production of overseam stitches with the oscillating loopers 7 and 8 and the loop-detainer 9 arranged below the bed-plate and also operatively connected with the main-shaft. The stitch-forming mechanism thus constituted is of that type in which both the jogging needle and the loop-taking means are mounted upon rotary supports whereby they are caused to perform a semi-rotation in the stitching of the eyelet-end of a buttonhole.

As represented, the feeding mechanism comprises an actuating cam 10 fixed upon the main-shaft and imparting vibratory movements to a lever 11 which are transmitted by suitable means to clutch-dogs 12 embracing the depending flange 13 of the cam-wheel 13 which is provided in its upper face with the feed-cam groove 14 and side-shift groove 15 and upon its periphery with the series of ratchet-teeth 16 extending throughout the greater portion of its circumference with the ends separated by a smooth portion 17.

The feed-cam groove 14 is entered by the roller-stud 18 depending from the lever 19 having one end fulcrumed by means of the stud-screw 20 upon the under side of the bed-plate and carrying at the opposite end a roller-stud 21 entering a transverse guideway formed in the block 22 secured by means of the screw 23 upon the under side of the plate 24 which is in turn secured to the side bars 25 to form a longitudinally sliding frame confined to suitable guides upon the bed-plate. Within the apertured bearing lugs 26 of the bars 25 is secured the cross rod 27 upon which are fitted depending lugs 28 of the cross slide-plate 29. This plate 29 has upon its lower face a block 30 with longitudinal guideway entered by the stud 31 on one end of the side-shift lever 32 fulcrumed intermediate its ends at 33 and having at its rearward end the boss 34 formed with a central aperture 35 within which is slidably fitted the plunger-pin 36 carrying at its lower end the roller-stud 37 normally entering the side-shift cam-groove 15.

The stem 36 of the plunger-pin extends upwardly through an aperture 38 in the plate 24 and is provided at its upper extremity with the head 39. Secured upon the plate 24 by means of screws 40 is a cam-plate 41 formed with a straight slot 42 in register with the aperture 38 and adapted to fit the opposite sides of the reduced intermediate portion 43 of the plunger-pin when raised, as represented in Fig. 8. Overlying the plate 41 at one side of the cam-slot 42 is the latch-plate 44 confined in position thereon by means of the screw-studs 45 passing through transverse slots 46 therein to permit movement of the latch-plate transversely of the slot 42. A spring 47 secured in position by one of the screws 40 serves to press the latch-plate toward the slot 42 to cause its overhanging edge to enter the groove 48 immediately above the portion 43 of the plunger-pin (Fig. 8).

The relative diameters of the parts 36 and 43, is such that, when the plunger-pin is locked in elevated position by the latch-plate 44, as represented in full lines in Fig. 8, the part 43 is closely embraced by the cam-slot 42 by means of which the side-shift lever 32 is held against lateral movement while the slide-frame with the plate 24 is permitted to perform its regular longitudinal feeding movements, while after retraction of the latch-plate the plunger-pin is permitted to descend for entrance of its roller-stud 37 within the cam-groove or track 15, as represented in dotted lines in Fig. 8, sufficient clearance is afforded between the stem 36 of the plunger-pin and the edges of the cam-slot 42 to permit the lateral movement of the plunger-pin under the action of the cam for production of the vibratory or side-shift movements of the lever 32. The plunger-pin, which constitutes a follower for both cam-tracks 15 and 42, is normally maintained in its lower position by gravity, but is locked against displacement from

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operative relation with the actuating cam-track by means of the latch-plate 44 which overhangs the upper extremity of that portion of the enlargement 43 of the plunger-pin above the groove 48.

Resting upon and movable with the slide-plate 29 are two clamp-plates 49 mounted thereon for reciprocal edgewise movement and affording the lower jaws of the work-holder whose upper jaws are afforded by clamping feet 50 carried by spring-arms 51 which are in practice sustained independently by the clamp-plates 49.

Fitted to suitable longitudinal ways within an opening in the bed-plate is the base-plate 52 formed with the spaced bearing lugs 53 sustaining the fulcrum-pin 54 upon which are mounted the hubs of the upper and lower cutter-levers 55 and 56 whose rearward ends embrace the transverse cutter-actuating shaft 57 carrying the cutter-lever actuating cam projections 57¹ and 57¹¹. The cutter-shaft carries the cam-disc 58 provided in one face with a cam-groove 58¹ entered by a stud 59¹ upon the link member 59 pivotally connected with a rearward extension 53¹ of one of the lugs 53, through which link the cutter-levers derive from the cam 58 travelling movements toward and from cutting position. The upper cutter-lever carries at its forward or operative end the adjustable and removable smooth faced cutter-block 60, and the lower cutter-lever 56 is formed at its outer end with the transverse head 61 provided with the transverse undercut channel 62 in which is fitted the cutter-carrying slide-plate 63. The plate 63 is formed upon opposite edges with flanges 64 one of which is provided with the spaced notches 65 adapted to be entered by the downturned latch-tooth 66 of a slide-bar 67 mounted within a channel-way in the side of the cutter-lever 56 in which it is confined by means of the strap 68. The slide-bar 67 has at its rearward end the lug 69 between which and a shoulder of the lever 56 is interposed the spring 70 to maintain the latch-tooth 66 normally in one of the notches 65, the lug 69 having secured thereto an upwardly extending finger piece 71 by means of which the slide-bar 67 may be retracted to permit the cutter slide-plate 63 to be shifted.

The slide-plate 63 has removably and adjustably secured thereto the spaced cutters 72 and 73, having at the rearward ends the pear-shaped cutting portions 72¹ and 73¹ of different sizes, and the intermediate straight cutting blade 74. The cutter 72, 72¹ having the larger eyelet end is designed for cutting eyelet-ended buttonholes preparatory to stitching, and that having the smaller eyelet-end is designed for cutting similar buttonholes subsequent to stitching, while the shorter straight bladed cutter 74 is designed for cutting a straight buttonhole slit. By retraction of the latch tooth 66, the cutter-plate 63 may be shifted so as to bring any one of these cutters into register with the cutter-block 60 constituting the upper cutting element, thereby adapting the machine for cutting buttonholes of different shapes or styles by a mere adjustment of the cutter-plate.

The cutter-shaft 57 carries the loose continuously running belt-wheel 75 formed upon its inner face with an annular flange 76 having spaced radial notches 77 adapted to be entered by a coupling tooth 78 upon the slide-block 79 mounted in a suitable radial guideway of the disc 80 fixed upon the cutter-shaft 57. The tooth 78 is engaged by the arm 81 of a spring carried by the disc 80 for pressing the tooth outwardly into coupling relation with the belt-wheel. The slide-block is held normally retracted by engagement of the lug 82 on the opposite face thereof by the cam-shaped edge 83 of the flange 84 upon the free end of the lever 85 fulcrumed upon the stud-screw 86. The temporary retraction of the lever 85 for release of the lug 82 permits the coupling of the belt-wheel and disc 80 to produce a rotation of the cutter-shaft which is arrested at completion thereof by reengagement of the lug 82 with the cam edge of the flange 84.

As shown and described in the said specification the hub 87 of the continuously running loose belt-wheel 88 upon the main-shaft is formed with an eccentric

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embraced by the strap 89 connected by the link 90 with a lateral arm 91 of a rock-shaft 92 provided with the upwardly extending crank-arms 93 and 94. To the crank-arm 93 is pivotally attached one end of the pawl-lever 95 which, with the primary and auxiliary holding pawls 96 and 97 acting upon the rack 98, serves to impart endwise step-by-step operative movements to the push-bar 99 carrying the block 100 which is normally maintained in engagement with the head 101 of the adjustable stop-bar 102 by means of the spring 103.

When the machine is at rest, the work-holder is disposed in cutting position at the extreme rearward end of its traverse and out of register with the stitch-forming mechanism, and preparatory to a stitching operation the feed-wheel receives a partial rotation to bring the work-holder into register with the stitch-forming mechanism. This is effected through the engagement of the peripheral ratchet teeth 16 by a spring-pressed pawl 104 (Fig. 1) carried by the push-bar 99, the extent of such initial movement being determined by the initial position of the bar 99 which is in turn determined by the position of the stop-member 101.

The pawls 95, 96 and 97 are normally held lifted above the rack 98 by engagement of the hook 96¹ of the primary holding pawl with a lateral lip at the upper end of the upwardly extending arm 106 of an elbow-lever fulcrumed at 107 and provided with the lateral arm 108 resting upon the face of the forked head 109 of the starting bar 110 journaled in the machine base. The cutter-shaft carries the cam 111 which, near the completion of a rotation, acts upon a spring-held extension 112 of the arm 106 by means of which the latter is disengaged from the holding pawl and an operative movement is thus imparted to the push-bar 99 which is communicated to the work-holder through the feed-cam, the disengagement of the actuating pawl from the rack-bar 98 being automatically effected at the completion of such movement.

The depending rearward extension 99¹ of the push-bar carries the tripping stud 113 which engages the depending arm 114 of the rock-shaft 115 sustaining the tilting stop-lever 116, and the tilting of said stop-lever disengages the tooth 117 upon the spring-pressed slide-block 118 carried by said lever from the clutch member 119 to cause the coupling of the belt-wheel 88 with the main-shaft and consequent operation of the stitch-forming mechanism and normal actuation of the feed-cam wheel in spacing the stitches and producing the side-shift movements of the work.

The slide-block 118 has, as represented in Fig. 4, a detachable connection with the plural-armed lever 120 pivotally mounted upon the hanger 121 sustained by the bed-plate and having a lateral arm formed with a bearing lip 122 normally sustained by means of the spring 123 in engagement with the inner face of the pawl-bar 124 connected at its rearward end with the rock-shaft arm 94 and having at its forward end the toothed extremity 125 adapted for engagement with the peripheral teeth 16 of the feed-cam wheel. When the slide-block 118 descends in the action of the stop-motion to arrest the stitch-forming mechanism, a bearing lip 126 of another arm of the rock-lever 120 thrusts the pawl-bar 124 into operative relation with the periphery of the feed-cam wheel, thereby continuing its movement until the operative portion 125 arrives at the smooth section 17, the cam-wheel having performed a complete rotation and the work-holder having thus been returned to initial cutting position.

The stop-lever 116 has at its upper end the lateral arm 116¹ adapted for engagement by the hooked extremity 127 of the detent-lever 128 fulcrumed at 129 and provided at its opposite end with the inclined nose 130. Secured upon the travelling plate 24 is a block 131 upon which is adjustably secured by means of the fastening screw 132 passing through the slot 133 the bar 134 carrying the fulcrum-stud 135 upon which is mounted the tripping dog 136 yieldingly maintained in normal upright position by means of a spring 137 with a stop-shoulder thereon resting upon the bar 134. In the longitudinal

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travel of the slide-frame 24, 25, the engagement of the dog 136 with an abrupt shoulder upon the lower edge of the detent-lever 128 causes the dog to tilt without shifting such lever in opposition to its spring 138; but upon the return of the slide-frame, the engagement of the inclined upper end of the now rigid tripping dog 136 with the extremity 130 of the detent-lever causes the tilting of the latter and release of the stop-lever 116, which, under the action of its spring 116¹¹ moves to stopping position.

The starting bar has fixed thereon intermediate its ends a thrust collar adapted for engagement with the upwardly extending arm of an elbow-lever fulcrumed upon a stud-screw and provided with the lateral arm connected by a cord or chain with actuating means such as a knee-lever or treadle acting in opposition to a spring. Fixed upon the forward end of the bar 110 is a tripping member formed with the angularly arranged arms 145, 146 and 147. The arm 145 is adapted for engagement with an extension 84¹ of the flange 84 of the lever 85, while the rounded upper extremity of the arm 146 is adapted to engage the under face of a lateral extension 148 of the trip-lever 149 fulcrumed upon the stud 150 to lift it out of operative relation with the tripping stud 151 carried by the feed-wheel. The forked rearwardly extending arm of this trip-lever embraces the extension 84¹ of the flange 84.

The arm 147 carries the spring-pressed pin 152 adapted, when the tripping member is in either the full line or dotted line position of Fig. 4, to enter one of two apertures 153 of the base 1 to maintain the bar 110 in the required position of adjustment. In the full line position of the parts, represented in the drawings, the shifting of the starting bar 110 obviously causes the initial rotation of the cutter-shaft and actuation of the cutter followed by the travel of the work-holder to stitching position and the stitching of the buttonhole which is succeeded by the return of the work-holder to initial position, a second actuation of the cutter being prevented by the displacement of the trip-lever 149 from the path of movement of the tripping-stud 151. When the tripping member 145, 146, 147 is turned into the dotted line position of Fig. 3, the arms 145 and 146 assume positions out of operative relation with the parts 84¹ and 149, and when the starting bar is actuated a rocking cam-plate 154 mounted in the block 109 is caused to first tilt the elbow-lever 106, 108 to set the push-bar actuating means in operation and thereafter lock such elbow-lever from a second actuation during the same cycle, the work-holder being first moved from cutting into stitching position, the stitching performed, the work-holder returned to cutting position and the cutting mechanism finally tripped into operation by engagement of the tripping stud 151 with the trip-lever 149 to cause the cutting of the buttonhole subsequent to stitching. With these different adjustments to determine the order of operation of the cutting and stitching mechanism, the appropriate cutting elements 72 and 73 are set in register with the cutter-block 60.

When a straight buttonhole is to be produced, for instance upon the lapel of a coat, the straight cutting blade 74 is shifted into register with the cutter-block 60 and the plunger-pin 36, which is normally in its lower position and in operative relation with the side-shift cam-track 15, is retracted to bring its reduced portion 43 within the slot 42 affording a stationary cam-track, and the cutting and stitching mechanisms set in operation in either order, thereby effecting the cutting and stitching of a straight buttonhole with one end reinforced by radially laid stitches. In this adjustment of the feeding mechanism the work-holder is restrained against lateral movement, and is confined to movements in opposite directions lengthwise of the buttonhole slit.

In the machine shown and described in the said specification the needle is mounted in such manner that it is at the same side of the axis of rotation of the needle-bar in both its edge-stitch and depth-stitch position; but in the machine as shown and described herein, the needle is sustained concentrically with the needle-bar in its edge-stitch position in order that its edge-stitch thrusts

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in working either the sides or ends of buttonholes may be in alignment with the straight slit. It is obvious, however, that the nature of the stationary cam-track 42 will be determined by the character of the machine in which the present improvement is embodied. Other means within the scope of the present invention will readily suggest themselves for controlling the lateral positions of the work-holder in changing from eyelet-end buttonholes to straight buttonholes through the shift-lever or otherwise, the characteristic features of the present invention being the provision upon one of the cutter-carrying members of a plurality of interchangeable cutting elements in connection with means for conforming the feeding movements of the work-holder with the contour of the style of cutter selected, and the provision of means of adjustment within the machine whereby the feed may be varied to change the style of the buttonhole stitching.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

(1) In a buttonhole sewing machine, in combination, cutting mechanism including a cutter-carrier and a plurality of cutting elements of different shapes mounted thereon, and feeding mechanism for producing between the stitch-forming mechanism and the work-holder relative travelling or feeding movements and side-shift movements, and comprising adjustable means whereby the relative movements between the stitch-forming mechanism and the work-holder are caused to conform with the contours of said cutting elements.

(2) In a buttonhole sewing machine, in combination, feeding mechanism, cutting mechanism including a cutter-carrier and interchangeable cutting elements mounted thereon, and feed-changing means adjustable to vary the feed of the work in conformity with the contours of the respective cutting elements.

(3) In a buttonhole sewing machine, in combination, feeding mechanism for producing relative movements between the stitch-forming mechanism and the work-holder and comprising means for producing feeding movements lengthwise of the buttonhole, means for producing side-shift movements crosswise of the buttonhole, actuating means, and means whereby said actuating means are maintained wholly ineffective in producing side-shift movements throughout a complete stitching cycle.

(4) In a buttonhole sewing machine, feeding mechanism for producing relative movements between the stitch-forming mechanism and the work-holder and comprising means for producing feeding movements lengthwise of the buttonhole and side-shift movements including a laterally movable element carrying a cam-follower, an actuating cam containing a cam-track for engagement by said follower, a cam-track sustained independently of said actuating cam, and means for maintaining said cam-follower in operative relation with either of said cam-tracks.

(5) In a buttonhole sewing machine, in combination, cutting mechanism comprising a cutter-carrier and interchangeable cutting elements of different shapes and lengths mounted thereon, feeding mechanism comprising means for producing relative work-advancing or feeding movements and side-shift movements between the stitch-forming mechanism and the work, means for varying the length of relative travel between the stitch-forming mechanism and the work, and adjustable means for controlling said side-shift movements.

(6) In a buttonhole sewing machine, in combination, cutting mechanism comprising a cutting element, a cutter-carrier, a plurality of eyelet-ended cutting elements and a straight-bladed cutting element mounted upon said carrier and each adapted to assume a position in operative relation with the first-named cutting element, feeding mechanism comprising means for producing relative work-advancing or feeding movements and side-shift movements between the stitch-forming mechanism and the work, adjustable means for controlling said

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side-shift movements, and adjustable means whereby the order of operation of the stitch-forming and cutting mechanisms may be determined.

Dated this 21st day of April, 1914.

CRUIKSHANK & FAIRWEATHER, LIMITED,

WALLACE CRANSTON FAIRWEATHER,

Director,

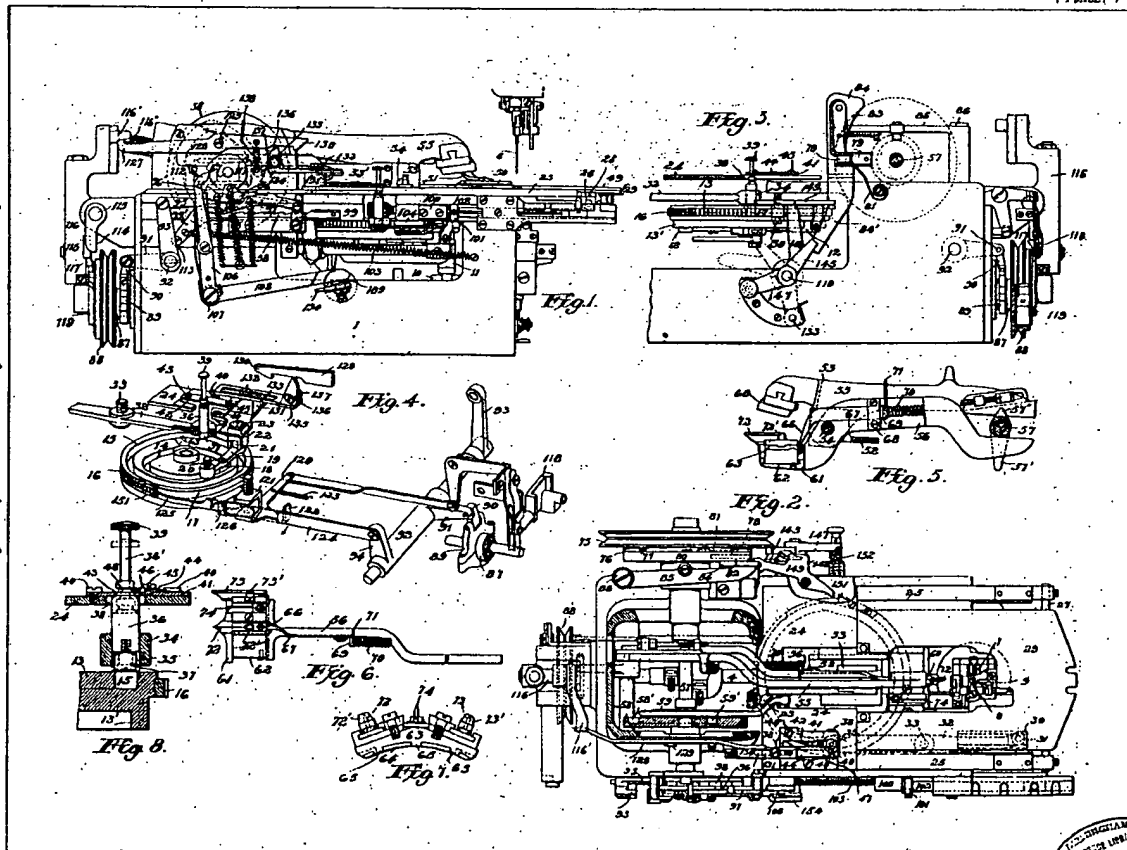
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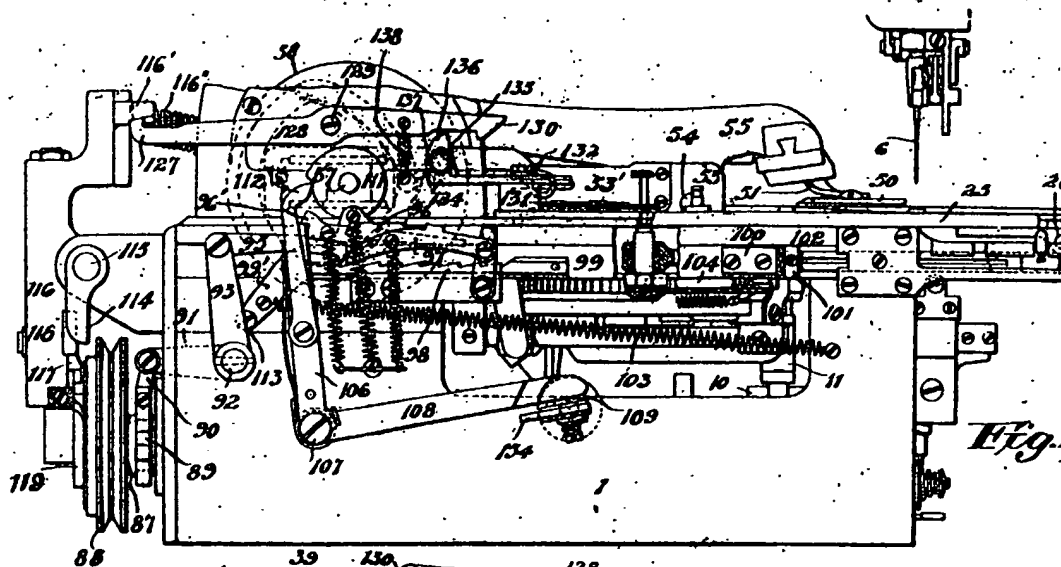


Fig. 1.

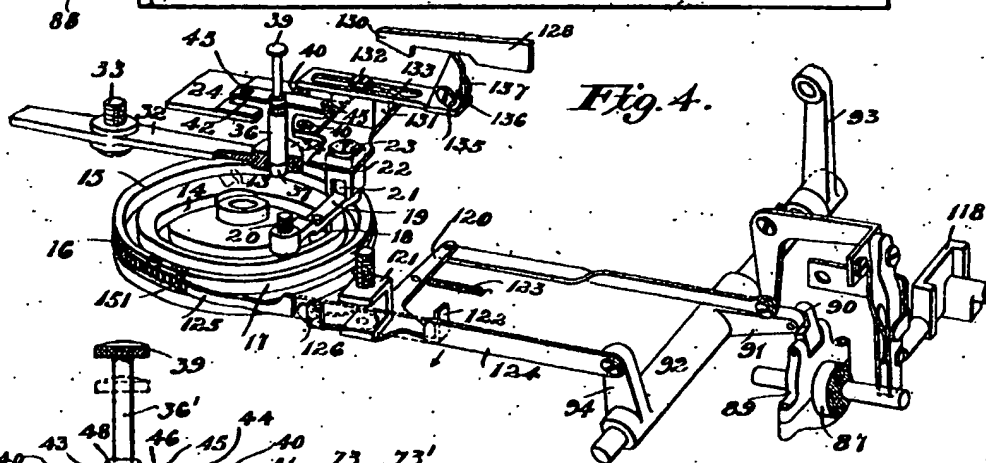


Fig. 4.

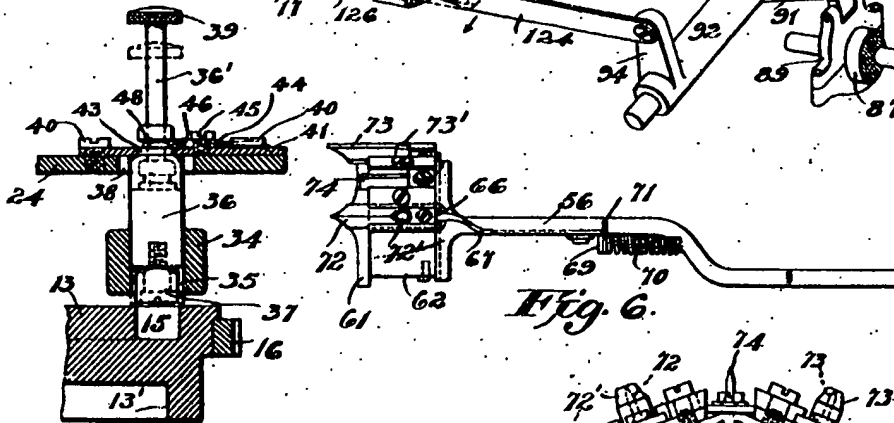


Fig. 6.

Fig. 8.

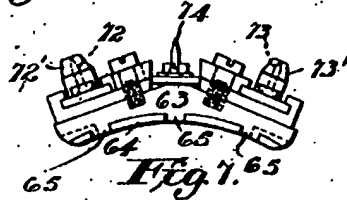


Fig. 7.

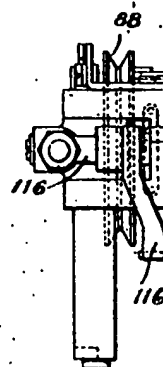
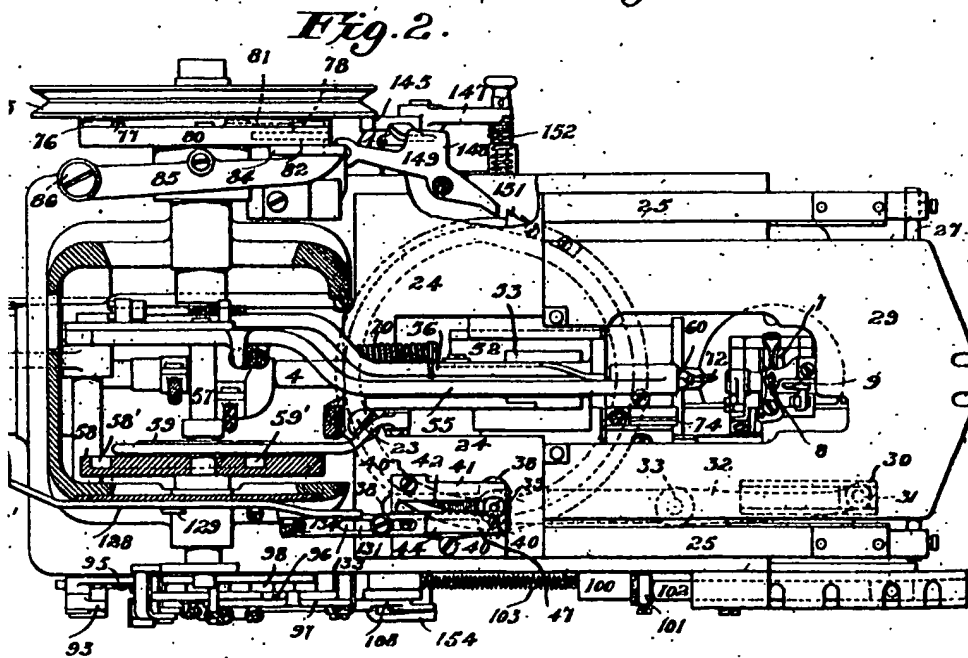
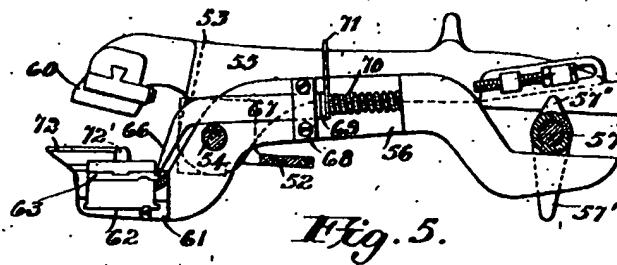
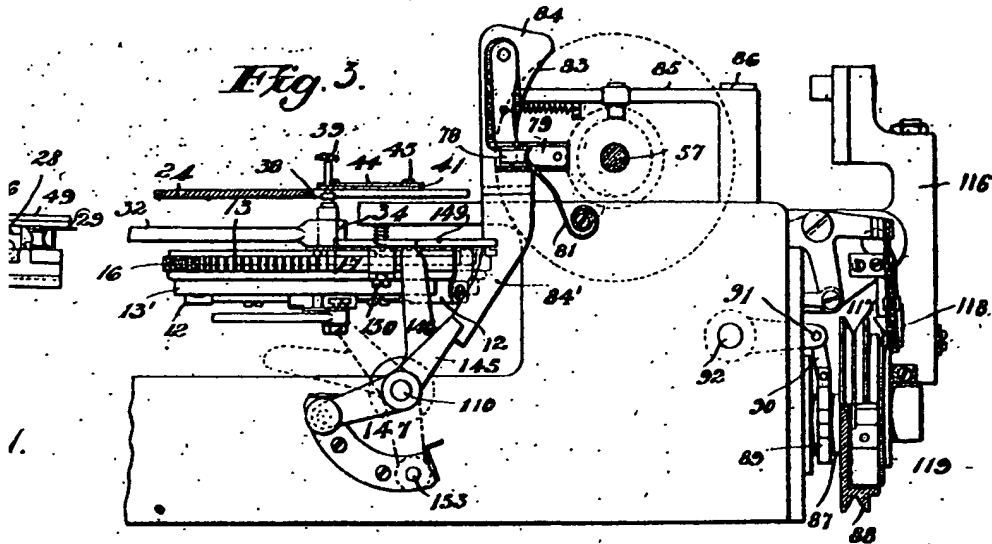


Fig. 5.



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